

NDCEE

National Defense Center for Environmental Excellence



DoD Executive Agent

Office of the
Assistant Secretary
of the Army
(Installations and
Environment)

Bullet Traps – Evaluations with Multiple Demonstrations/Validations

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This work was funded by ODASA(ESOH) and conducted under Contract W74V8H-04-D-0005, Tasks 0407 and 0414.

The NDCEE is operated by:  Concurrent Technologies Corporation

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE MAY 2007		2. REPORT TYPE		3. DATES COVERED 00-00-2007 to 00-00-2007	
4. TITLE AND SUBTITLE TransformationBullet Traps - Evaluations with Multiple Demonstrations/Validations				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) National Defense Center for Energy and Environment (NDCEE),Concurrent Technologies Corporation,100 CTC Drive,Johnstown,PA,15904				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 62	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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Background

- The DoD has an environmental requirement to maintain compliance with local, state, and federal regulations as well as DoD directives and initiatives to minimize environmental impacts from military training activities.
- The U.S. military operates more than 1,800 small arms firing ranges, the majority of which utilize soil/sand as a berm or impact area for fired rounds.
- A single 5.56mm (M855) bullet contains 2.07 grams of lead.
 - RCRA-eligible waste materials with lead concentrations greater than 5mg/L or generating a TCLP leachate greater than 5mg/L are to be handled and disposed of as a hazardous material.

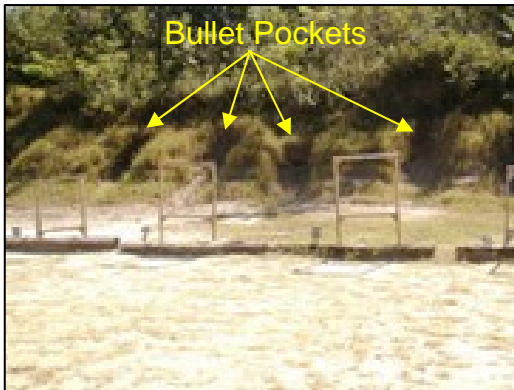
NDCEE Bullet Trap Efforts

- **NDCEE Task 319:** Demonstrated 4 lanes of the STAPP Bullet Catcher at a small arms firing range (Ft. A.P. Hill).
- **NDCEE Task 414:** On-going effort to further demonstrate and validate the STAPP Bullet Catcher, including a prototype design for .50 cal, at small arms firing ranges (Ft. A.P. Hill, Massachusetts Military Reservation, a cold climate site – Ft. Drum, and a hot climate site – Yuma Proving Ground).
- **NDCEE Task 407, Subtask 2:** Identified and analyzed 20 bullet trap technologies to produce a summary report of the state-of-the-art as an information tool for DoD procurement. Demonstrated 4 down-selected bullet trap technologies.

STAPP Bullet Catcher 2003 - 2004

- **Conducted a 6-month limited dem/val:** The bullet traps were installed at Ft. A.P. Hill and evaluated per the test plan. The systems operated as claimed by the manufacturer for small arms ammunition up to and including 9mm.
- **Transferred technology to a DoD installation:** A Bullet Catcher was installed on two separate ranges (Range 4 and Range 5). Three firing points were covered on Range 4 and one firing point was covered on Range 5.
- **Demonstrated total bullet containment:** The top rubber cover of each Bullet Catcher received more than 15,000 various small-arms rounds including tracer rounds.
- **Performed beyond design parameters:** The top rubber cover accommodated .50 caliber rounds *plus* tracers. Both exceed the design capability with *no* sympathetic ignition from tracers.

Technology Overview



1. Original Berm



2. Berm Grading



3. Berm Grading Complete



4. Adding Granular Rubber



5. Applying Top Cover



6. Installation Complete

Granular Rubber



The granular rubber is approximately the size of a BB.

Results/Summary of Findings

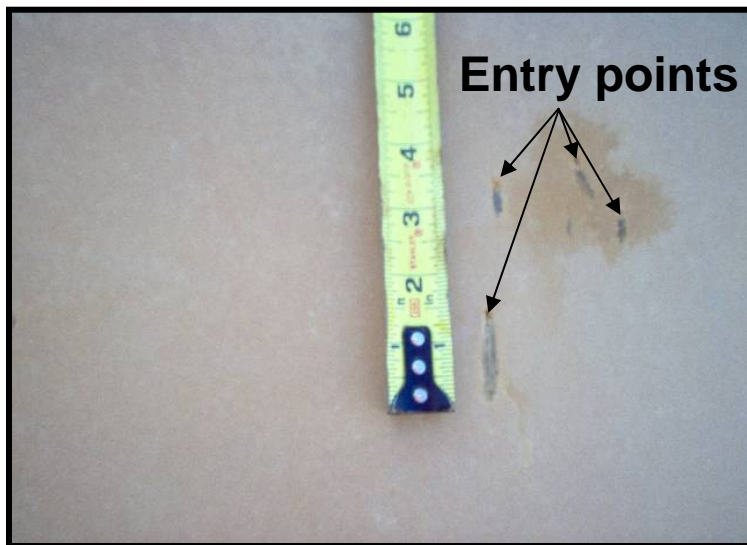


**Troops firing .50 cal rounds at
Ft. A.P. Hill.**



Results/Summary of Findings

Due to the top rubber cover's elasticity, openings that are caused by impacting bullets “seal” and prevent precipitation from entering the Bullet Catcher.

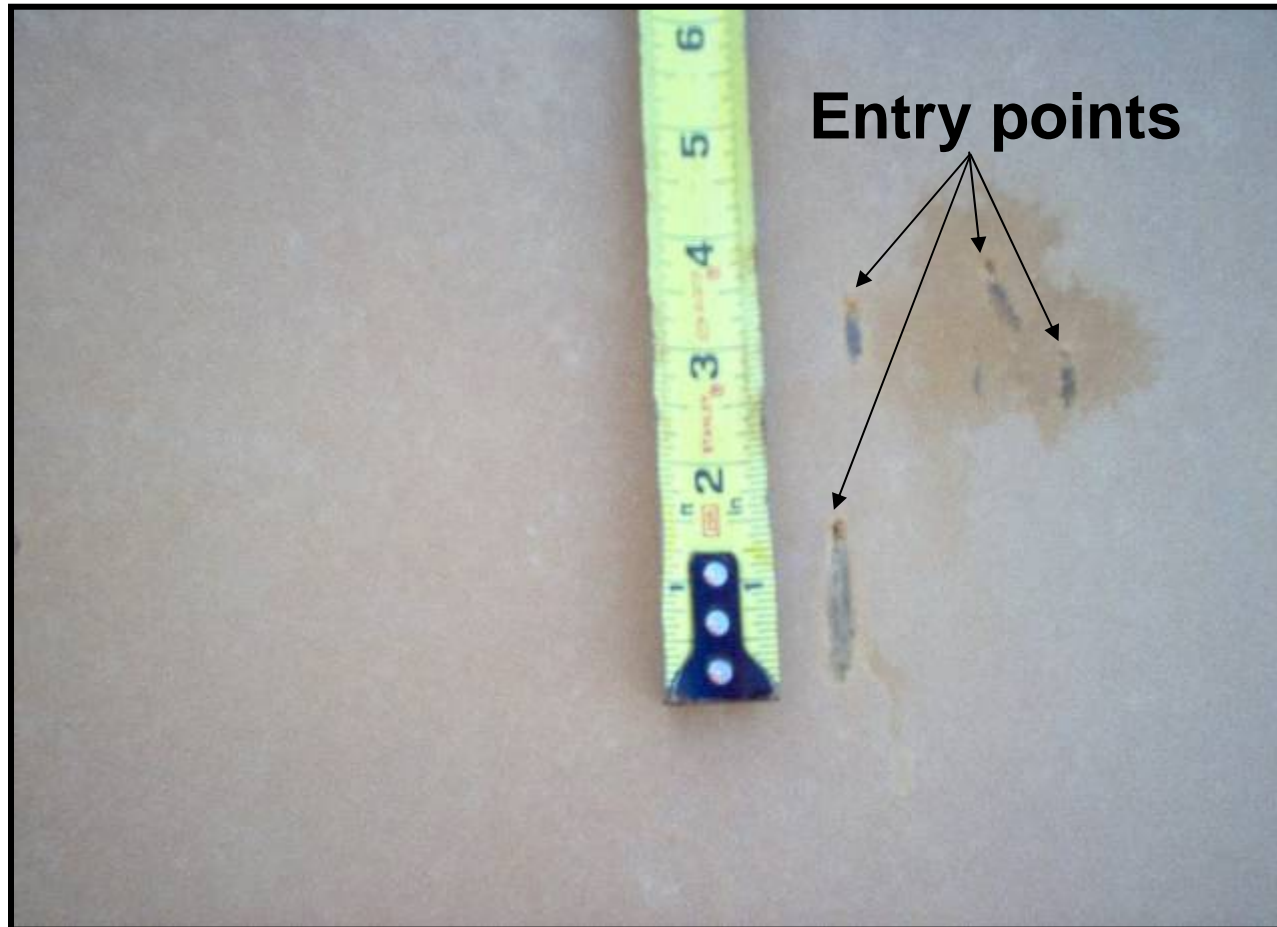


Marks and entry points on the top rubber cover caused by .50 cal rounds



Marks and entry points on the top rubber cover caused by 5.56mm rounds

Results/Summary of Findings



Due to the top rubber cover's elasticity, openings that are caused by bullets will "seal" and prevent precipitation from entering the Bullet Catcher

Marks and entry points on the top rubber cover caused by .50 cal rounds

Results/Summary of Findings

■ Range 4

- Total rounds fired 17,057 (14,357 5.56mm, 2,700 9mm)
- Approximately 10 tracer rounds
- No armor piercing rounds

■ Range 5

- Total rounds fired 16,177 (8,277 5.56mm, 2,470 7.62mm, 5,430 .50 cal)
- Approximately 2,380 tracer rounds
- 2,500 armor piercing rounds

Results/Summary of Findings

Range 4

- Bullets were sifted from a hot spot measuring approximately 70" x 50" from each lane (52, 53, 54).
- 67 lbs. of bullets were removed from the three hot spots.
- Approximately 11–12 gallons of water were removed from the water collection reservoir for analysis of lead concentration.
- There were no holes/tears in the bottom rubber liner.
- Two range vegetation fires occurred while no threats of fire occurred with the Bullet Catcher.

Range 5

- Bullets were sifted from a hot spot measuring approximately 80" x 55".
- 15 lbs. of bullets were removed from the hot spot.
- Approximately 6 gallons of water were removed from the water collection reservoir for analysis of lead concentration.
- There were several holes/tears in the bottom rubber liner due to .50 caliber rounds.

Range 4 Bottom Rubber Liner

No holes or tears were found upon visual inspection of the bottom rubber liner.



Range 4 Lane 52



Range 4 Lane 53



Range 4 Lane 54

Range 5 Bottom Rubber Liner

- Multiple holes/tears were observed during visual inspection of the bottom rubber liner. The vendor states that the depth of the granular rubber (2 ft.) was not sufficient and can be adjusted to properly decelerate .50 cal rounds.
- .50 cal rounds are slightly larger than the Bullet Catcher's performance limitation of 12mm.



Range 5 (holes/tears circled, some with bullets protruding)

STAPP Bullet Catcher 2005 - 2007

- Build upon previous efforts to conduct a more robust demonstration/validation of the STAPP Bullet Catcher as an alternative to soil backstops by performing technical, economical, and environmental evaluations at Ft. A.P. Hill, the Massachusetts Military Reservation (MMR), a cold climate site (Ft. Drum, NY), and a hot climate site (Yuma Proving Ground, AZ)
- Decrease the threat to the environment by verification of vendor claims and technology performance
- Test a .50 caliber-rated prototype Bullet Catcher design
- Perform controlled condition testing of the STAPP Bullet Catcher to determine if it can perform effectively and up to vendor claims in a cold and hot climate area under extreme rates of fire

Bullet Catchers Installed at Ft. A.P. Hill, VA in December 2005



- **Above** – 20-lane Bullet Catcher installed on Range 4, a 25m – zero range
- **Top Right** – Front view of the one-lane .50 caliber rated Bullet Catcher prototype installed on Range 5
- **Bottom Right** – Side view of the one-lane .50 caliber rated Bullet Catcher prototype installed on Range 5 (Note that the trap is buried into the ground to prevent low flying or off-target rounds from penetrating the front or sides of the trap)



Ft. A.P. Hill Data

- More than 117,000 rounds were fired upon the Range 4 Bullet Catcher at Ft. A.P. Hill during the 12-month firing phase, while 2,010 rounds were fired upon the .50 caliber-rated prototype. Note: Of the 2,010 rounds fired on Range 5, 1,500 were .50 caliber loaded with tracer rounds.
- The overall trap condition, including the top rubber cover and water collection reservoir, was inspected quarterly.
- Maintenance was required to re-glue sections of the top rubber cover seams on Range 4. No significant water, other than that from snowfall during installation (~10 gallons), had been visible in the water collection reservoir during the 12-month dem/val.



Snow on open Bullet Catcher



The same area a few hours later

Ft. A.P. Hill Data (cont'd)

- Maintenance costs to re-glue loose seams
 - Labor, based at \$12/man-hour - \$72 (6 man-hours)
 - Materials (sandpaper, rags, rubbing alcohol, glue) - \$0, materials were included with the bullet trap
 - **TOTAL COST - \$72.00**



Loose top rubber cover seam

Bullet Catcher Installed at the MMR in June 2006



15-lane Bullet Catcher installed on Range T at the MMR. Dem/val to occur in Summer 2007, though seam maintenance and water collection has been occurring.

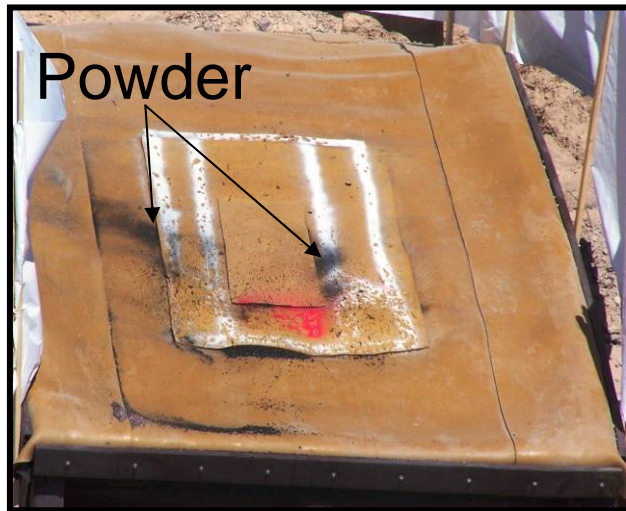
Hot Climate Testing – Yuma Proving Ground, AZ

- Fired more than 30,000 5.56mm rounds (M855), including 1,401 5.56mm tracer rounds (M856), in a 2' x 4' impact area over a two day period.
- Fired 2 squad automatic weapons (SAWs) simultaneously at the same impact area at a rate of 5-10 round bursts.
- Documented air temperatures reached 110°F.



Above: Marines simultaneously firing upon the STAPP Bullet Catcher at the YPG.

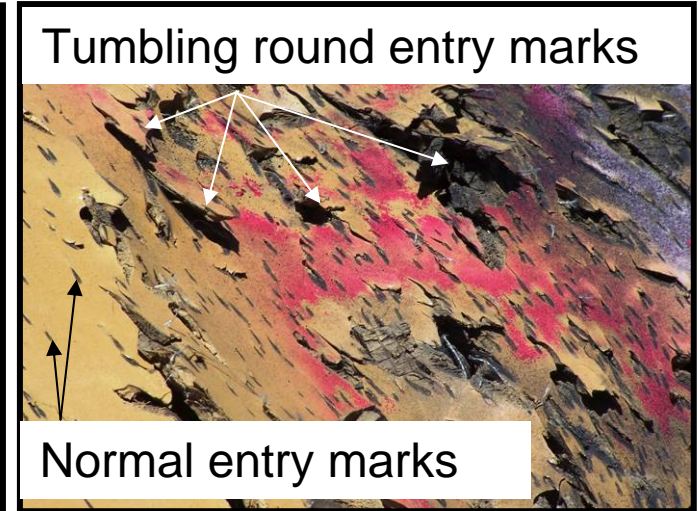
YPG Data



Powder material escaping the trap via blown out seams.



Tears in the top rubber cover caused by tumbling rounds.



Close-up of tears caused by tumbling rounds compared to normal entry marks.

YPG Data (cont'd)

- The 2' x 4' impact area had 31,005 5.56mm rounds fired upon it and did not require bullet sifting.
- The ignition temperature of tracer rounds is much higher than the flash point of the granular rubber (380°F), yet the trap did not catch fire.
- The lead concentration of the powdery material that exited the trap via blown out seams and/or holes made by tumbling rounds was ~5.5% (54,700 mg/Kg).

Bullet Sifting Results

Size/Caliber	Total Number of Rounds Fired	Weight of Lead per Bullet (gm/lbs.)	Weight per Bullet (gm/lbs.)	Total Lead Weight (gm/lbs.)	Total Bullet Weight (gm/lbs.)	Total Weight of Sifted Bullets (gm/lbs.)
5.56mm (M855)	29,604	2.07 gm	4.02gm	61,280 gm or 135.1 lbs.	119,008 gm or 262.4 lbs	190 lbs.
5.56mm (M856)	1,401	2.07 gm	4.13gm	2,900 gm or 6.4 lbs.	5,786 gm or 12.8 lbs.	

The bullet weight captured during bullet sifting was 69% of the total bullet weight fired upon the trap. The 31% of bullet weight not recovered may be attributed to the fact that not all rounds impacted the target area and that some bullets may have fragmented and/or pulverized due to repeated bullet impacts and were too small to be collected in the accumulation pail. Some small particles bypass the accumulation pail and are captured in a HEPA filtration system.

YPG Conclusions

- The Bullet Catcher vendor claim that the trap can accept no less than 30,000 small arms rounds in a 2' x 4' impact without requiring bullet sifting to be performed is valid.
- The Bullet Catcher can accept tracer rounds in a hot and arid environment and under extreme firing conditions without evidence of fire, smoldering, or smoke generation.
- The assumption can be made that if a Bullet Catcher were installed upon a clean, lead-free range, the amount of lead introduced to the environment would be significantly less than the amount introduced into the environment using a soil berm.

Cold Climate Testing – Ft. Drum, NY

- Fired 4,800 5.56mm rounds (M855) in a 2' x 4' impact area in a 1hr. 10 min.
- Fired 2 squad automatic weapons (SAWs) simultaneously at the same impact area at a rate of 5-10 round bursts.
- Documented air temperatures were as low as 18.5°F during the firing phase.

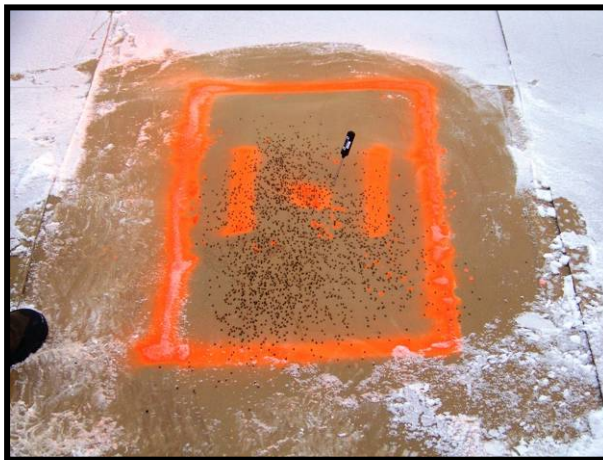


SAWs and equipment in place to fire upon the Bullet Catcher

Ft. Drum Data



Firing upon the
Bullet Catcher



Condition after
firing 2,400 rounds



Condition after
firing 4,800 rounds

Ft. Drum Data (cont'd)

Size/Caliber	Total Number of Rounds Fired	Weight of Lead per Bullet (gm/lbs.)	Weight per Bullet (gm/lbs.)	Total Lead Weight (gm/lbs.)	Total Bullet Weight (gm/lbs.)	Total Weight of Sifted Bullets (gm/lbs.)
5.56mm (M855)	4,800	2.07 gm	4.02gm	9,936 gm or 21.9 lbs.	19,296 gm or 42.5 lbs	<i>TBD</i>

Bullet sifting occurred on May 9, 2007.

Ft. Drum Conclusions

- The Bullet Catcher vendor claims of being able to accept small arms rounds (M855) in a 2' x 4' impact effectively and reliably in a cold climate environment is valid.
- The Bullet Catcher can accept 5.56mm (M855) rounds in a cold climate environment and under extreme firing conditions and without causing excessive damage to the top rubber cover.

Path Forward

- Conduct bullet sifting at Ft. Drum (May 2007)
- Conduct bullet sifting at Ft. A.P. Hill (May 2007)
- Conduct MMR dem/val (2007)

Benefits

- The MMR has recently called a voluntary cease fire of all tungsten-nylon rounds due to preliminary data from groundwater testing indicating the presence of significant amounts of tungsten. The Bullet Catcher may be a solution to allow the MMR to return to firing lead ammunition.
- The use of a bullet trap decreases the amount of small arms ammunition constituents being introduced directly into the soil and reduces soil erosion and range vegetation fires.
- Ranges previously unusable because of safety issues evolving from the saturation of a soil berm will be deemed usable following the installation of a bullet trap.

State-of-the-Art Technology Assessment

- Conducted national and international searches
- Solicited facility feedback to confirm or rebut vendor information
- Populated over 400 data points of information
 - Bullet stopping capabilities
 - Fire retardant capabilities
 - Lead containment capabilities
 - Ricochet and angle of acceptance
 - Disposal costs
- Evaluated 20 bullet trap technologies in a down-selection process using the data points gathered.
 - Down-selection points breakdown:
 - 24% for basic capabilities
 - 47% for environmental and health hazards
 - 27% for cost and maintenance factors
 - 2% for procurement time

Technology Down-Selection and Dem/Val

- Reviewed the NDCEE down-selection results with the task stakeholders to determine the four technologies to demonstrate (listed in descending order of total point results)
 - Ballistics Research Inc. – Advanced Anti-Ballistic Composite (AABC)
 - Action Target Inc. – Total Containment Trap (TCT3)
 - Meggitt Defense Systems-Caswell – Reclining GranTrap
 - Savage Range Systems (SRS) – Snail Trap (wet)
- Note: The STAPP Bullet Catcher scored highly but was not selected because was selected for evaluation under another effort.
- Conducted demonstration activities at DoD host sites
 - Barksdale AFB, LA – Snail Trap (wet)
 - Fort Campbell, KY – Reclining GranTrap
 - Fort Indiantown Gap, PA – TCT3
 - Fort Jackson, SC - AABC

Down-Selected Bullet Traps for Dem/Val



**Savage Snail “Wet” system at
Barksdale AFB, LA**



**Action Target TCT3 at
Ft. Indiantown Gap, PA**



**MDS-Caswell Reclining GranTrap
at Ft. Campbell, KY**



**Ballistic Research Inc. AABC at
Ft. Jackson, SC**

Savage Snail “Wet” Trap Capital Costs

- SRS estimated capital costs for a Model 855 Snail Trap, similar to the model at Barksdale AFB, at \$175,000 to \$200,000 for 8 firing lanes. This estimate was for materials only and did not include:
 - Delivery
 - Installation
 - On-site design, engineering, and supervision
 - Commission
 - Installation and training
 - An extended 5-year Warranty (approximately \$14,767 additional)

Snail Trap Noise and Dust Testing

Noise Monitoring			
Training Cycle	Run Time	Maximum Reading (decibels)	Average Reading (decibels)
Cycle 1	2 hours 50 min.	133.0 decibels	110.5 decibels
Cycle 2	2 hours 15 minutes	133.7 decibels	110.3 decibels

Dust Monitoring					
Analyte	Method	Reporting Limit	Total	Air Concentration	OSHA Limit
Dust – Total Nuisance	NIOSH 0500	0.01 mg	0.06 mg	0.093 mg/m3	15 mg/m3
Lead	NIOSH 7300	0.0025 mg	< 0.0025 mg	< 0.0039 mg/m3	0.05 mg/m3

Snail Trap Dem/Val Results

Round Type	Number of Rounds Fired	Lead/Round (grams)	Total Lead (grams)	Total Lead (pounds)
5.56-mm	90,575	2.07	187,490	413.43
7.62-mm	16,614	6.28	104,335	230.03
9-mm	15,294	6.54	100,022	220.50
TOTAL	122,483*	NA	391,847	863.96

** Firing primarily occurred on lanes 2 and 5*

Snail Trap Dem/Val Results (cont'd)

■ Maintenance Activities

- The water/Snail Oil recirculation pump needed to be replaced because it burned out due to low fluid levels. Fluid levels decreased because of faulty welds, which allowed the water/Snail Oil solution to escape.
- Several deflector plates were ground or replaced to maintain the correct angle of deflection.
- Multiple seams needed to be re-welded because of leaks at the original welds. The leaks resulted in the release of water/Snail Oil solution, which had to be refilled. A gutter system was designed and installed to correct this issue.
- Daily and Monthly Maintenance Activities
 - Check the water level of the tank
 - Check the Snail Oil concentration
 - Remove any debris from the front trough
 - Inspect the trap for signs of damage or excessive wear
 - Inspect the conveyor belt and motor

Snail Trap Dem/Val Results (cont'd)



Collected rounds are transported on a conveyor system to an accumulation pail



View of exit point and collected rounds in the accumulation pail

Reclining GranTrap Capital Costs and Installation Photos

Capital costs for a 56 linear foot (approximately 4 firing lanes) Reclining GranTrap, including a concrete foundation - \$106,000



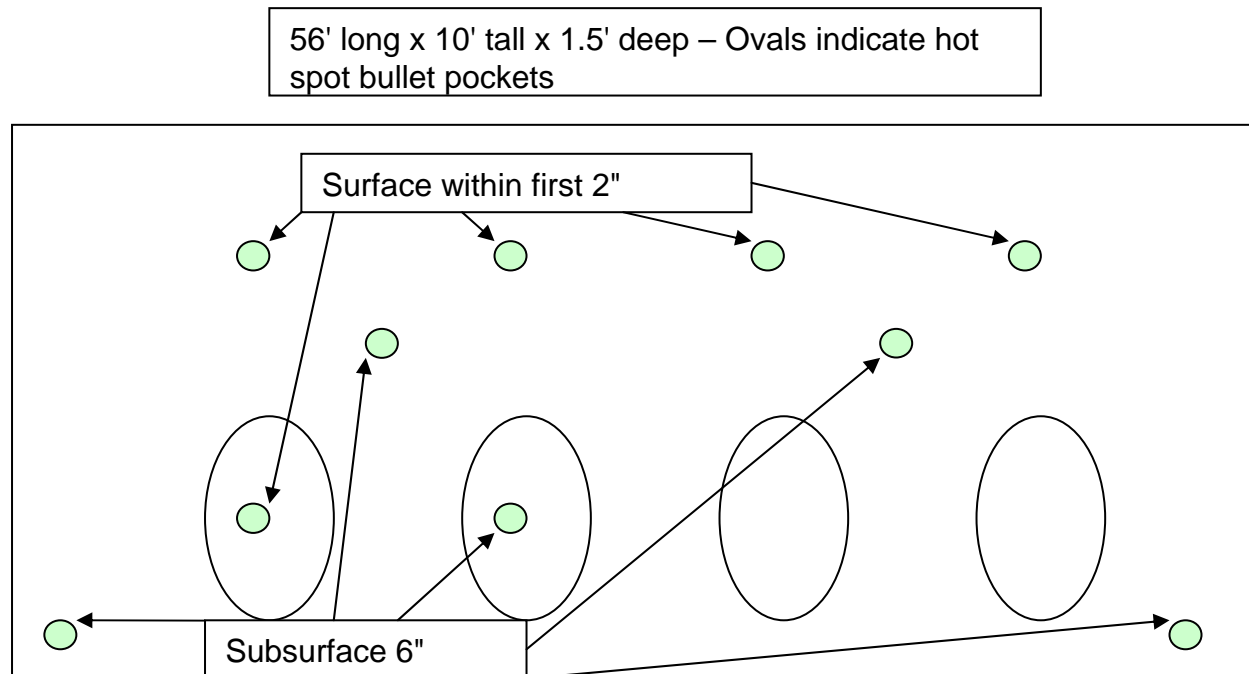
Reclining GranTrap TCLP Testing of the Chunk Rubber

A sample of the chunk rubber was gathered from the far left firing lane hot spot for TCLP metals analysis. The TCLP results are shown below.

Prairie Analytical Systems, Inc.				Date: 17-Jan-06	
CLIENT: Concurrent Technologies Corporation				Lab Order: 0601087	
Project: 01333.0407_AA.002.400 Bullet Trap					
Lab ID: 0601087-001				Collection Date: 11/22/2006 10:30:00 AM	
Client Sample ID: Granular Rubber				Matrix: SOLID	
Analyses	Result	Limit	Qual	Units	DF
TCLP METALS ANALYSIS		SW6020	(SW3005A)		Analyst: MCL
Arsenic	U	0.0150		mg/L	3
Barium	0.0204	0.0060		mg/L	3
Cadmium	U	0.0030		mg/L	3
Chromium	0.0073	0.0060		mg/L	3
Lead	43.6	0.100		mg/L	50
Mercury	U	0.0006		mg/L	3
Selenium	0.0638	0.0150		mg/L	3
Silver	U	0.0150		mg/L	3

Reclining GranTrap TCLP Testing of the Chunk Rubber (cont'd)

A representative sample of the chunk rubber was gathered for TCLP metals analysis. The Sample Plan utilized the 80/20 sampling method as shown below.



Reclining GranTrap TCLP Testing of the Chunk Rubber (cont'd)

TCLP results for the representative chunk rubber sample



2950 Foster Creighton Road Nashville, TN 37204 * 800-765-0980 * Fax 615-726-3404

Client Aron Enviro. & Geoscience Llc (11028)
8245 Madisonville Road
Hopkinsville, KY 42240
Attn Jeff Major

Work Order: NPA2408
Project Name: Arnon
Project Number: R-10
Received: 01/24/06 11:30

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPA2408-01 (R-10 Rubber - Solid/Soil) Sampled: 01/23/06 07:20								
TCLP Metals by 6000/7000 Series Methods								
Arsenic	ND		mg/L	0.100	1	01/25/06 19:09	W846 1311/6010	6014072
Barium	ND		mg/L	0.100	1	01/25/06 19:09	W846 1311/6010	6014072
Cadmium	ND		mg/L	0.0100	1	01/25/06 19:09	W846 1311/6010	6014072
Chromium	ND		mg/L	0.0500	1	01/25/06 19:09	W846 1311/6010	6014072
Lead	0.767		mg/L	0.0500	1	01/25/06 19:09	W846 1311/6010	6014072
Mercury	ND		mg/L	0.0100	1	01/27/06 22:52	W846 1311/7470	6014091
Selenium	ND		mg/L	0.100	1	01/25/06 19:09	W846 1311/6010	6014072
Silver	ND		mg/L	0.0500	1	01/25/06 19:09	W846 1311/6010	6014072

Reclining GranTrap Dem/Val Results

Round Type	Number of Rounds Fired	Lead/Round (grams)	Total Lead (grams)	Total Lead (pounds)
5.56-mm ball rounds	44,676	2.07	92,479	203.88
7.62-mm ball rounds	13,900	6.28	87,292	192.45
7.62-mm armor piercing rounds	480	6.28	3,014	6.64
TOTAL	59,056 (14,764/lane)	NA	182,785	402.97

Note: Of the 480 7.62mm AP rounds fired from 10 meters in single fire and burst mode, none penetrated through the depth of the trap

Reclining GranTrap Dem/Val Results (cont'd)



A mostly intact lead bullet found in front of the bullet trap at Ft. Campbell KY



Degradation of the bullet trap, including the forward kick out of rubber and bullets

Reclining GranTrap Dem/Val Results (cont'd)

■ Maintenance Activities

- The plastic mesh that retains the chunk rubber requires zip-tying new mesh sections after a 1' x 1' section is compromised by bullet impact. This was accomplished monthly as part of maintenance inspections.

■ Bullet Trap Disposal

- Three contractors provided quotes for disposing of the 56 linear feet of Reclining GranTrap. The quoted costs ranged from \$24K to \$31K.
- Disposal charges are directly affected by lead concentrations.
- The NDCEE and the Ft. Campbell Environmental Office were able to coordinate the recycling of the concrete and 55,000 lbs of rubber.

Advanced Anti-Ballistic Composite (AABC) Capital Costs

- The capital costs of the equipment, including shipping and installation, for four firing lanes was \$3,545/AABC block. Block dimensions were 40"L x 32"W x ~14"D.
- The vendor has stated that due to changes in the manufacturing process, the selling price has increased to greater than \$14K per block of the same dimensions.

AABC Installation Photos



AABC Noise and Dust Testing

Noise Monitoring			
Firing Lane	Run Time	Maximum Reading (decibels)	Average Reading (decibels)
Lane 45 (AABC equipped)	4 hrs., 4 min.	116.7 decibels	87.9 decibels
Lane 46 (Not AABC equipped)	5 hrs., 22 min.	116.2 decibels	88.4 decibels

Dust Monitoring					
Analyte	Method	Reporting Limit	Total	Air Concentration	OSHA Limit
Dust – Total Nuisance	NIOSH 0500	0.01 mg	0.06 mg	0.093 mg/m3	15 mg/m3
Lead	NIOSH 7300	0.0025 mg	< 0.0025 mg	< 0.0039 mg/m3	0.05 mg/m3

AABC Dem/Val Results

Round Type	Number of Rounds Fired	Lead/Round (grams)	Total Lead (grams)	Total Lead (pounds)
5.56-mm ball rounds	13,203	2.07	27,330	60.25
5.56-mm armor piercing rounds	4,618	2.07	9,559	21.07
TOTAL	17,821 (4,400 - 4,500 per lane)	NA	36,881	81.32

AABC Dem/Val Results (cont'd)

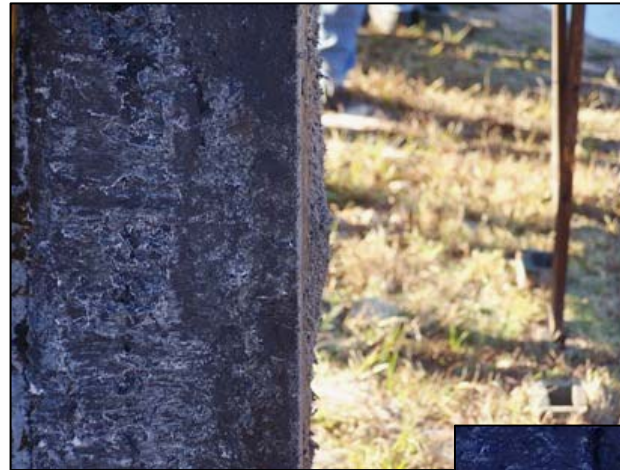


Close up shot of the AABC on firing lane 42 on October 13, 2005



Regrowth of the vegetation behind the AABC-equipped firing lanes 76 days after installation.

AABC Dem/Val Results (cont'd)



Photographs showing the effects that approximately 4,500 rounds had on the AABC.

Note the slight bulge on the front side of the block (side view).

AABC Dem/Val Results (cont'd)

■ Maintenance Activities

- No maintenance activities were required during the Dem/Val effort

■ Disposal Costs

- The disposal cost for an AABC block containing lead bullets at Fort Jackson is \$425/block (\$1,700 for all four blocks)

Total Containment Trap (TCT3) Capital Costs

■ Capital Costs

- Cost of 40-linear feet of the TCT3 was \$164,000 (or \$41,000/lane) for materials and installation
- This amount does not include the cost of the required concrete foundation pad, which was \$18,750
- Total Capital Costs---\$182,750

TCT3 Installation at Ft. Indiantown Gap



TCT3 Noise and Dust Testing

<i>Noise Monitoring</i>			
Firing Lane	Duration	Maximum Reading (Decibels)	Equivalent Continuous Level (Decibels)
Lane 3(TCT3 equipped)	2 hrs., 10 mins	133.1 decibels	80 decibels
Lane 9(not TCT3 equipped)	1 hr., 20 mins	109 decibels	80 decibels

<i>Dust Monitoring</i>				
Test	Method	OSHA Limits	Results	
			<i>Total</i>	<i>Air Concentration</i>
Dust (Total Nuisance)	NIOSH 0500	15 mg/m3	0.13 mg	0.15 mg/m3
Lead	NIOSH 7300	0.05 µg/m3	2.9 µg	11 µg/m3

TCT3 Dem/Val Results

- Occurred March 13, 2006 – June 13, 2006.
- The TCT3 requires electricity for proper operation. A 30 kW generator was provided by FTIG to conduct this dem/val.
- 2,304 5.56mm rounds were fired upon the trap during the dem/val.

Dem/Val Results (cont.)

Range 9Z	Size/Cal	Number of Rounds Fired	Lead/Round (grams)	Total Lead (grams)	Total Lead (pounds)
March 2006	5.56 mm ball	1,728	2.07	3,577	7.86
April 2006	5.56 mm ball	0	2.07	0	0
May 2006	5.56 mm ball	0	2.07	0	0
June 2006	5.56 mm ball	576	2.07	1,192	2.63
TOTAL		2,304	NA	4,769	10.49

Dem/Val Results (cont.)

- No maintenance was required during the dem/val.
- The TCT3 has not been removed from FTIG, therefore disposal costs cannot be calculated.



Status of
the trap
prior to last
firing cycle



Summary/Conclusions of State-of-the-Art Technology Assessment

- There were not enough rounds fired on any of the bullet traps to determine their saturation points. It would be important to use every trap to its saturation point, perform the required lead removal, maintenance, and repair activities to return the trap to usability multiple times to fully assess the trap.
- Tracer ammunition is an important part of training. As documented at Ft. Campbell, any trap that can not handle tracer rounds will become a potential fire hazard at most DoD installations. Controls such as SOPs, ASP issues, and Range Control scheduling are insufficient to eliminate the risk of possible tracer firing upon a bullet trap.
- With regard to rubber media used in granular rubber-based traps, it has been found that after bullet sifting and removal, the remaining rubber media may not be a hazardous waste.
- Weather conditions were typically non-factors in the evaluation of these traps. A defined weather testing would produce complete data regarding weather influences and how the traps perform in different climates.

Project Stakeholders

- Office of the Deputy Assistant Secretary of the Army - Environment, Safety, and Occupational Health
- U.S. Army Environmental Command (USAEC)
- U.S. Army (Ft. A.P. Hill, Ft. Campbell, Ft. Drum, Ft. Indiantown Gap, Ft. Jackson, Massachusetts Military Reservation/Camp Edwards, Yuma Proving Ground)
- Barksdale Air Force Base

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Acknowledgements

- NDCEE Executive Agent
- NDCEE Program Director
- NDCEE Program Manager
- NDCEE Contracting Officer's Representative
- Government Technical Monitors

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